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Lifetime Prevalence of Mental Disorders in Lebanon: First Onset, Treatment, and Exposure to War

Elie G. Karam^{1,2,3*}, Zeina N. Mneimneh^{3,4}, Hani Dimassi^{3,5}, John A. Fayyad^{1,2,3}, Aimee N. Karam^{1,2,3}, Soumana C. Nasser^{3,6}, Somnath Chatterji⁷, Ronald C. Kessler⁸

1 Department of Psychiatry and Clinical Psychology, Saint George Hospital University Medical Center, Beirut, Lebanon, **2** Department of Psychiatry and Clinical Psychology, Faculty of Medicine, Balamand University Medical School, Beirut, Lebanon, **3** Institute for Development, Research, Advocacy and Applied Care (IDRAAC), Beirut, Lebanon, **4** Survey Methodology Program, Institute for Social Research, University of Michigan, Ann Arbor, Michigan, United States of America, **5** School of Nursing, Faculty of Medicine, American University of Beirut, Beirut, Lebanon, **6** School of Pharmacy, Lebanese American University, Byblos, Lebanon, **7** World Health Organization (WHO), Geneva, Switzerland, **8** Department of Health Care Policy, Harvard Medical School, Boston, Massachusetts, United States of America

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Abbreviations: ADHD, attention deficit/hyperactivity disorder; CI, confidence interval; CIDI, Composite International Diagnostic Interview; DSM, Diagnostic and Statistical Manual; GAD, generalized anxiety disorder; ICD, International Classification of Diseases; IDRAAC, Institute for Development, Research, Advocacy and Applied Care; IED, intermittent explosive disorder; LEBANON, Lebanese Evaluation of the Burden of Ailments and Needs of the Nation; MDD, major depressive disorder; OR, odds ratio; PTSD, post-traumatic stress disorder; SAD, separation anxiety disorder; SCID, Structured Clinical Interview for DSM-IV; WHO, World Health Organization; WMH, World Mental Health

* To whom correspondence should be addressed. E-mail: egkaram@idraac.org

ABSTRACT

Background

There are no published data on national lifetime prevalence and treatment of mental disorders in the Arab region. Furthermore, the effect of war on first onset of disorders has not been addressed previously on a national level, especially in the Arab region. Thus, the current study aims at investigating the lifetime prevalence, treatment, age of onset of mental disorders, and their relationship to war in Lebanon.

Methods and Findings

The Lebanese Evaluation of the Burden of Ailments and Needs Of the Nation study was carried out on a nationally representative sample of the Lebanese population ($n = 2,857$ adults). Respondents were interviewed using the fully structured WHO Composite International Diagnostic Interview 3.0. Lifetime prevalence of any *Diagnostic and Statistical Manual of Mental Disorders*, fourth edition (DSM-IV) disorder was 25.8%. Anxiety (16.7%) and mood (12.6%) were more common than impulse control (4.4%) and substance (2.2%) disorders. Only a minority of people with any mental disorder ever received professional treatment, with substantial delays (6 to 28 y) between the onset of disorders and onset of treatment. War exposure increased the risk of first onset of anxiety (odds ratio [OR] 5.92, 95% confidence interval [CI] 2.5–14.1), mood (OR 3.32, 95% CI 2.0–5.6), and impulse control disorders (OR 12.72, 95% CI 4.5–35.7).

Conclusions

About one-fourth of the sample (25.8%) met criteria for at least one of the DSM-IV disorders at some point in their lives. There is a substantial unmet need for early identification and treatment. Exposure to war events increases the odds of first onset of mental disorders.

The Editors' Summary of this article follows the references.

Introduction

Large-scale psychiatric epidemiologic studies have become increasingly common in industrialized countries in the past decade [1–5] in response to mounting concerns about the prevalence and burden of mental disorders [6,7]. Psychiatric epidemiological surveys are much less common, in comparison, in the Arab World and have so far focused on small populations [8–11]. Furthermore, although war has been linked to a higher risk of mental disorders [12–16], no previous study has comprehensively assessed on a national level the effect of war on the first onset of a broad range of mental disorders during the life span of individuals. In an effort to address these issues, the Institute for Development, Research, Advocacy and Applied Care (IDRAAC) with the Department of Psychiatry and Clinical Psychology at Balamand University and Saint George Hospital University Medical Center conducted the first nationally representative general population survey of mental disorders in Lebanon and the Arab World: the Lebanese Evaluation of the Burden of Ailments and Needs Of the Nation (LEBANON) survey. This survey is part of the World Health Organization (WHO) World Mental Health (WMH) Survey Initiative, a series of coordinated, large-scale psychiatric epidemiologic surveys being carried out in over 29 countries in the world [17].

We reported previously that 17% of Lebanese adults meet criteria for at least one *Diagnostic and Statistical Manual of Mental Disorders*, fourth edition (DSM-IV) disorder in the year preceding the interview [18]. The current report assesses the lifetime prevalence, the risk of ever developing, the age of onset, and the treatment delay of mental disorders in Lebanon. Moreover, the effect of war exposure intensity on developing a first onset of mental disorder was explored in a multivariate time-dependent analysis.

Methods

Participants

A nationally representative, stratified multistage clustered area probability sample of noninstitutionalized adults (aged ≥ 18 y) who had no cognitive or physical impairment preventing participation was selected for this study. A total of 342 primary sampling units (area segments) were selected with probabilities proportional to size to represent the different geographic areas in the country. Complete household listing was carried out in the area segments. A sample of households was selected from each segment, and one eligible family member was randomly selected from each sampled household using the Kish method [19]. The final stage selected the spouse of the primary respondents in a random 10% of the households for a focused analysis on assortative mating. The response rate was 70.0%, with 2,857 completed interviews [18]. The initial target sample (3,000 interviews) was set by WHO as the minimum needed to obtain sufficient level of precision for WMH participation.

Males constituted 45.4% of the sample; one-third (33.8%) of respondents were 18–34 y old, another third (32.6%) 35–49 y old, and the remaining third (33.7%) older than 49 y (with 14.3% older than 64 y). The study procedures were approved by the Balamand University Medical School Ethics Committee.

Procedures

Face-to-face interviews were conducted in the respondents' households between September 2002 and September 2003 by

116 interviewers who were trained by certified Composite International Diagnostic Interview (CIDI) trainers. Interviews were conducted in two parts. Part I included a core diagnostic assessment of all respondents ($n = 2,857$). Part II ($n = 1,031$) included an assessment of risk factors and other correlates of disorders, and was administered to all Part I respondents who met lifetime criteria for any core disorder plus a probability subsample of the remaining Part I respondents. Part I was weighted for differential probability of selection within households and post-adjusted to government population data on sociodemographic and geographical variables [20]. Part II was additionally weighted for differential probability of subsampling from the Part I sample.

Diagnostic Assessment

The diagnostic instrument used in the survey was the WHO Composite International Diagnostic Interview (CIDI 3.0) [21], a fully structured, lay-administered interview generating both *International Statistical Classification of Diseases and Related Health Problems, 10th Revision* (ICD-10) and DSM-IV diagnoses. DSM-IV criteria are used in the current report to generate diagnoses of anxiety, mood, impulse control, and substance disorders. The list of disorders assessed is presented in Table 1. Two childhood impulse control disorders, conduct disorder (CD) and attention deficit/hyperactivity disorder (ADHD), were limited to respondents ages 18–44 y to reduce recall bias. Retrospective age-of-onset reports were obtained using a unique probing method designed to stimulate active memory search and accurate reporting. Methodological research has shown that this method yields much more plausible age-of-onset reports than those obtained using standard questioning [22].

The Arabic version of CIDI 3.0 was translated from the original English using a rigorous WHO-monitored five-step process that included forward translation, backward translation, and resolution of discrepancies between translations, pilot testing, and final revision. More details on this process and other aspects of instrument adaptation have been published elsewhere [18]. Although the Arabic CIDI 3.0 has not yet been validated, validation against the Structured Clinical Interview for DSM-IV (SCID) [22] has been completed in WMH surveys carried out in France, Italy, Spain, and the United States [23,24], documenting consistently good individual-level CIDI–SCID concordance as well as aggregate prevalence estimates that were either unbiased or conservative in the CIDI relative to the SCID.

Sociodemographic Correlates

The sociodemographic correlates used in the analysis include age (18–34, 35–49, 50–64, and older than 64 y), sex, education (student, low [none/only primary], middle-low [intermediate/some secondary], middle [completed secondary without university], high [university degree]), and marital status (single, married, and previously married: separated/divorced/widowed). In the time-dependent analysis that linked war exposure to first onset of disorder, age was defined based on onset of the Lebanon wars in 1975, which ended in 1990. These age groups were appropriately corrected for the impulse control subsample: young children (0–10 y for anxiety and mood; 0–6 y for impulse control), adolescents (11–18 y for anxiety and mood; 7–16 y for impulse control), young adults (19–35 y for anxiety and mood; not

Table 1. Lifetime Prevalence of Mental Disorders and Age

Category	Disorder	Total		Sex ^a		Age, Years ^b			
				Female	Male	18–34	35–49	50–64	65+
		No.	% (SE)	% (SE)	% (SE)	% (SE)	% (SE)	% (SE)	% (SE)
Anxiety disorders	Panic disorder	16	0.5 (0.1)	0.7 (0.2)	0.3 (0.1)*	0.2 (0.1)	1.2 (0.4)	0.4 (0.2)	0.4 (0.4)
	Agoraphobia without panic	13	0.5 (0.1)	0.7 (0.2)	0.1 (0.1)	0.5 (0.3)	0.5 (0.2)	0.1 (0.1)	0.8 (0.7)
	Specific phobia	202	7.1 (0.5)	10.2 (0.7)	4.0 (0.8)**	8.4 (0.7)	7.3 (1.1)	5.1 (1.1)	4.3 (1.5)**
	Social phobia	52	1.9 (0.4)	2.1 (0.5)	1.7 (0.5)	2.8 (0.7)	1.5 (0.4)	1.0 (0.5)	0.4 (0.3)**
	Generalized anxiety disorder	61	2.0 (0.3)	2.8 (0.4)	1.1 (0.3)**	1.8 (0.5)	2.3 (0.6)	1.4 (0.5)	2.9 (1.1)
	PTSD ^c	70	3.4 (0.6)	5.8 (1.1)	1.0 (0.3)**	3.4 (1.2)	3.6 (1.0)	3.7 (1.5)	2.5 (0.8)
	Separation anxiety/adult SAD ^d	95	6.1 (1.0)	8.1 (1.4)	4.1 (1.0)**	7.8 (1.5)	6.7 (1.8)	2.2 (0.7)	3.2 (1.7)*
Mood disorders	Any anxiety disorder ^e	282	16.7 (1.6)	24.8 (2.1)	8.6 (1.7)**	19.4 (2.2)	18.8 (2.2)	9.6 (2.5)	10.6 (3.4)**
	MDD	283	9.9 (0.9)	12.8 (1.1)	7.0 (1.0)**	8.5 (1.3)	12.4 (1.1)	10.9 (1.3)	9.1 (2.3)
	Dysthymia	34	1.1 (0.2)	1.6 (0.3)	0.7 (0.3)	0.6 (0.3)	1.8 (0.6)	1.8 (0.5)	1.1 (0.7)
	Bipolar disorders	61	2.4 (0.4)	2.3 (0.5)	2.6 (0.5)	3.9 (0.7)	1.7 (0.4)	0.6 (0.2)	0.2 (0.2)*
Impulse control disorders	Any mood disorder	352	12.6 (0.9)	15.4 (1.2)	9.8 (0.9)**	12.6 (1.2)	14.4 (1.2)	12.1 (1.4)	9.3 (2.4)
	Conduct disorder ^d	13	1.0 (0.4)	0.1 (0.1)	1.9 (0.8)**	0.8 (0.4)	1.7 (0.8)	—	—
	ADHD ^d	20	1.5 (0.4)	1.6 (0.6)	1.4 (0.6)	1.6 (0.5)	1.3 (0.6)	—	—
	Intermittent explosive disorder	43	1.7 (0.5)	1.2 (0.4)	2.2 (0.7)	2.8 (0.9)	1.0 (0.2)	0.2 (0.1)	0.3 (0.3)**
Substance abuse disorders	Any impulse control disorder ^e	53	4.4 (0.9)	3.6 (1.1)	5.1 (1.6)	4.7 (1.2)	3.5 (1.1)	—	—
	Alcohol abuse	38	1.5 (0.3)	0.4 (0.3)	2.7 (0.6)**	2.1 (0.4)	1.2 (0.5)	1.1 (0.5)	0.8 (0.4)
	Alcohol dependence	9	0.4 (0.2)	0.4 (0.3)	0.3 (0.2)	0.6 (0.3)	0.3 (0.2)	0.2 (0.1)	0.0 (0.0)
	Drug abuse ^c	6	0.5 (0.2)	0.1 (0.1)	0.9 (0.5)**	0.1 (0.1)	0.4 (0.2)	2.0 (1.8)	0.0 (0.0)*
	Drug dependence ^c	3	0.1 (0.1)	0.1 (0.1)	0.2 (0.2)	0.1 (0.1)	0.2 (0.2)	0.2 (0.2)	0.0 (0.0)
Any disorder ^e	Any substance abuse disorder ^c	27	2.2 (0.8)	0.6 (0.3)	3.8 (1.6)**	2.7 (1.6)	1.9 (0.7)	2.5 (1.8)	0.0 (0.0)**
		491	25.8 (1.9)	33.1 (2.6)	18.4 (2.4)**	29.1 (3.1)	26.9 (2.5)	21.4 (4.1)	15.2 (3.9)
Two or more disorders ^e		234	10.5 (1.4)	13.8 (1.8)	7.0 (1.3)**	12.1 (2.2)	11.6 (1.4)	6.8 (1.9)	5.9 (2.2)*
Three or more disorders ^e		105	4.6 (0.7)	6.0 (1.0)	3.2 (0.7)*	5.5 (1.2)	5.1 (1.0)	2.3 (1.0)	2.3 (1.1)*

DSM-IV organic exclusion rules and diagnosis hierarchy rules were used in making diagnoses, except for substance use disorders, where abuse was defined with or without dependence, in recognition of abuse often being a stage in the progression to dependence.

*Statistical significance at $p < 0.05$.

** $p < 0.01$.

^a χ^2 with $df = 1$ for all disorders.

^b χ^2 with $df = 3$ for all disorders except for conduct, attention deficit hyperactivity disorders (ADHD), and any impulse disorder where $df = 1$.

^cAssessed in Part II sample ($n = 1,031$).

^dSAD, conduct, and attention deficit hyperactivity disorders were assessed among Part II respondents in the age range 18–44 ($n = 595$).

^eThese summary measures were analyzed in Part II sample ($n = 1,031$). SAD, conduct, and ADHD were coded as absent among respondents who were not assessed for these disorders. SE, standard error.

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applicable for impulse control), and adults (>35 y for anxiety and mood; not applicable for impulse control). This study was completed before a more recent outbreak of war in July 2006.

War-Related Traumatic Events

In light of previous evidence that prevalence of psychiatric disorders during the years of the Lebanon war was strongly related to exposure to war-related traumata [10], information on exposure to a list of war-related traumatic events was added to the CIDI 3.0. Ten war events were assessed and included in this analysis: civilian in war region, civilian in terror region, refugee, rescue worker, witness death or injury, witness atrocities, death of close one, trauma to close one, kidnapped, and robbed or threatened by weapon. These war events were summarized into one index that reflects the level of war exposure as follows: none, one event, two events, three events, and four-plus events.

Use of Mental Health Services

Information on whether respondents ever talked about their symptoms to a physician or other professional (psychologist, counselor, spiritual advisor, herbalist, acupuncturist, and other healing professionals) was assessed in each

diagnostic section of the CIDI 3.0. Information was also obtained on age at first treatment contact.

Statistical Analysis

Projected lifetime risk was estimated using retrospective age-of-onset reports to estimate conditional probability of first onset at each year of life up to and including age 74 y. The actuarial method [25] was used to cumulate these conditional probability estimates. Predictors of first onset of disorder were analyzed using discrete-time survival analysis with person-year the unit of analysis [26]. Moreover, marital status, education, and war exposure were used as time-variant variables controlling for each year of the respondent's life. Survival coefficients were exponentiated and were reported as odds ratios (ORs). All the models included age cohorts defined at the onset of the Lebanese wars. The first set of models had the five war exposure levels entered as dummy variables producing multiple ORs, with no exposure as a reference. To increase statistical power, we combined the war dummy variables into one index by generating individual level-predicted probabilities of the outcome based on the coefficients of the dummy variables. Interactions between this war index and demographics (age cohorts and sex) were tested. Significant interactions were explored further with contrast statements to identify differ-

Table 2. Ages at Selected Percentiles on the Standardized Age-of-Onset Distributions of Disorders with Projected Lifetime Risk at 75 y

Category	Disorder	Projected Lifetime Risk	Age at Selected Age-of-Onset Percentiles							
			5	10	25	50	75	90	95	99
Anxiety disorders	Panic disorder ^a	—	—	—	—	—	—	—	—	—
	Agoraphobia without panic ^a	—	—	—	—	—	—	—	—	—
	Specific phobia	7.9 (0.7)	5	5	5	11	13	29	48	68
	Social phobia	2.0 (0.4)	6	7	11	14	18	20	26	30
	GAD	3.9 (0.7)	14	18	28	39	55	59	71	71
	PTSD ^b	5.3 (0.7)	10	10	19	30	43	51	56	56
	Separation anxiety/adult SAD ^c	7.6 (1.1)	7	8	13	19	29	41	56	56
	Any anxiety disorder ^d	20.2 (1.8)	5	5	8	13	28	47	56	71
Mood disorders	MDD	17.2 (1.3)	16	18	24	34	48	58	66	75
	Dysthymia	2.1 (0.6)	16	18	21	33	49	66	66	66
	Bipolar disorders	2.9 (0.4)	14	14	16	20	27	39	44	46
	Any mood disorder	20.1 (1.2)	15	17	21	31	45	56	66	75
Impulse control disorders	Conduct disorder ^{a,c}	—	—	—	—	—	—	—	—	—
	ADHD ^{a,c}	—	—	—	—	—	—	—	—	—
	Intermittent explosive disorder	1.8 (0.5)	13	13	14	16	19	23	27	31
	Any impulse control disorder ^d	4.6 (1.0)	7	8	9	14	19	26	27	31
Substance abuse disorders	Alcohol abuse	2.1 (0.4)	16	18	20	23	35	43	58	58
	Alcohol dependence ^a	—	—	—	—	—	—	—	—	—
	Drug abuse ^{a,d}	—	—	—	—	—	—	—	—	—
	Drug dependence ^{a,d}	—	—	—	—	—	—	—	—	—
	Any substance abuse disorder ^{a,d}	—	—	—	—	—	—	—	—	—
Any disorder ^d		32.9 (2.1)	5	5	11	19	35	53	58	71

^aNumber of cases too small ($n \leq 30$) to be included in analysis.

^bPTSD was assessed in Part II sample ($n = 1,031$).

^cSAD, conduct, and attention deficit hyperactivity disorders were assessed among Part II respondents in the age range 18–44 y ($n = 595$).

^dThese summary measures were analyzed in Part II sample ($n = 1,031$). SAD, conduct, and ADHD were coded as absent among respondents who were not assessed for these disorders. doi:10.1371/journal.pmed.0050061.t002

ential associations. All the analyses were weighted to account for differential sample selection and subsampling for specific questionnaire sections. Design variables were also used in all of the analyses to adjust for stratification and clustering when estimating standard errors. Standard errors of prevalence estimates and 95% confidence intervals (CIs) of ORs were obtained using the Taylor series method [27]. Standard errors of the projected lifetime estimates were obtained from using the jackknife repeated replication method [28]. Analyses were carried out using SAS 9.1 and SUDAAN.

Results

Lifetime Prevalence of Mental Disorders

About one-fourth of the sample (25.8%) met criteria for at least one of the DSM-IV disorders at some point in their lives, with 10.5% having more than one disorder. Anxiety disorders were more common (16.7%) than mood (12.6%), impulse control (4.4%), and substance use disorders (2.2%). The most prevalent individual disorder was major depression (9.9%). A number of disorders varied across the different age groups, consistently being most common in younger age groups. Females had more lifetime anxiety and mood disorders than males, whereas the latter had more substance abuse and conduct disorders (Table 1).

Projected Lifetime Risk

Projecting lifetime risk to age 75 y, approximately one-third of respondents (32.9%) were expected eventually to meet criteria for one or more of the DSM-IV disorders. The highest projected risk was for major depression (17.2%). Median

estimated age-of-onset ranged from a low of 11 y for specific phobia to a high of 39 y for generalized anxiety disorder (GAD) (Table 2). Half of all respondents who are expected ever to have a disorder in their lives, will have an onset by age 19 y.

War-Related Traumatic Events

The two most commonly reported war events were being a civilian in war zone (55.2%) and being a refugee (37.7%) (Table 3). Almost half of the Lebanese (47%) were exposed to one or two events, almost one-quarter (21.8%) were exposed to three or more events, while almost one-third (31.2%) were not exposed to any event. Males were more likely to have been rescue workers ($\chi^2_{df=1} = 6.5, p = 0.01$), to have witnessed death or injury ($\chi^2_{df=1} = 27.5, p < 0.001$) and atrocities ($\chi^2_{df=1} = 19.5, p < 0.001$), and to have been kidnapped ($\chi^2_{df=1} = 110.4, p < 0.001$) or robbed or threatened by a weapon ($\chi^2_{df=1} = 13.6, p < 0.001$) than females. Females, on the other hand, were more likely to be civilians in a war zone ($\chi^2_{df=1} = 6.4, p = 0.01$) and refugees ($\chi^2_{df=1} = 26.4, p < 0.001$). Uncontrollable events such as the death of someone close ($\chi^2_{df=1} = 1.3, p = 0.3$) or trauma to a loved one ($\chi^2_{df=1} = 1.9, p = 0.2$) were not related to sex. The middle age groups (11–35 y) at the onset of the Lebanon wars were the most exposed to the majority of the war events ($\chi^2_{df=3} = 49.3, p < 0.001$) (Table 3).

Individual War Traumatic Events

Using the discrete-time survival analysis, our study showed that individuals exposed to individual war events were at a higher risk for developing a mental disorder for the first time ever, controlling for age, sex, marital status, and education. Exposure to these events still increased the odds of first onset

Table 3. Differences in Exposure to Individual and Cumulative War Events by Sex and Age at Start of War

Category	Event	People Exposed, <i>n</i> ^a	Total % (SE)	Sex		Age at Start of War, Years			
				Female	Male	0–10	11–18	19–35	>35
				% (SE)	% (SE)	% (SE)	% (SE)	% (SE)	% (SE)
Individual war events	Rescue worker	37	3.0 (0.9)	1.2 (0.5)	4.8 (1.8)*	2.9 (1.1)	5.8 (2.5)	2.8 (1.6)	1.0 (0.6)
	Witness death or injury	208	18.0 (1.3)	10.2 (1.6)	26.0 (2.2)**	13.5 (2.0)	27.1 (4.2)	24.0 (3.0)	18.2 (4.2)**
	Witness atrocities	119	10.6 (1.4)	5.5 (1.4)	15.8 (2.1)**	7.2 (1.7)	15.7 (4.3)	16.0 (2.6)	10.8 (3.5)*
	Civilian in war zone	620	55.2 (2.9)	61.2 (3.5)	49.0 (4.0)*	46.8 (3.8)	61.2 (6.8)	68.4 (4.6)	62.5 (4.7)**
	Civilian in terror region	114	8.6 (1.5)	6.5 (1.3)	10.6 (2.4)*	7.9 (2.0)	8.7 (2.3)	9.7 (2.8)	9.1 (2.4)
	Refugee	447	37.7 (3.6)	44.4 (4.0)	30.9 (3.5)**	32.2 (5.0)	55.2 (7.0)	45.3 (4.8)	30.9 (5.1)**
	Death of close one	125	10.2 (1.2)	9.2 (1.3)	11.2 (1.8)	4.6 (1.1)	16.0 (6.0)	21.4 (3.7)	9.2 (2.3)**
	Trauma to close one	92	7.6 (0.8)	5.9 (1.3)	9.4 (1.7)	5.7 (1.0)	10.1 (3.8)	11.8 (2.3)	6.5 (2.6)
	Kidnapped	44	3.0 (0.7)	0.04 (0.0)	6.1 (1.5)**	1.8 (0.6)	4.3 (2.3)	5.0 (2.2)	3.9 (2.2)
	Robbed/threatened by weapon	42	2.2 (0.5)	0.6 (0.2)	3.9 (1.1)**	1.0 (0.4)	4.6 (2.0)	4.4 (1.8)	1.4 (1.0)*
Number of war events ^b	None	268	31.2 (3.2)	27.9 (3.5)	34.6 (4.1)**	41.4 (4.6)	15.4 (4.4)	16.0 (3.4)	28.6 (4.3)**
	One	233	23.6 (2.5)	25.4 (3.6)	21.8 (3.1)	21.7 (3.3)	22.8 (5.3)	25.7 (4.6)	29.3 (6.2)
	Two	252	23.4 (2.2)	29.4 (3.5)	17.4 (2.4)	22.5 (3.9)	29.0 (5.2)	23.6 (4.2)	21.7 (4.6)
	Three	129	10.7 (1.3)	11.6 (2.3)	9.8 (1.6)	5.7 (1.4)	17.2 (4.3)	18.9 (4.1)	11.4 (3.6)
	Four+	149	11.1 (1.2)	5.8 (1.0)	16.5 (1.9)	8.6 (1.2)	15.5 (3.8)	15.8 (3.4)	9.0 (2.5)

*Statistical significance with $p < 0.05$.** $p < 0.01$.^aNumber of people exposed represents unweighted frequencies and was assessed in Part II sample ($n = 1,031$)^bSignificance level was measured using Chi-square for number of war events (as one categorical variable) versus sex and age each as one categorical variable.

SE, standard error.

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of mental disorders, even after controlling for the occurrence of other war traumata.

Witnessing death or injury in war time (OR 1.52, 95% CI 1.04–2.23), having a close person die (OR 1.48, 95% CI 1.03–2.12), and being a civilian in a war zone (OR 1.48, 95% CI 1.11–1.97) increased the odds of developing any mood disorder. Witnessing atrocities (OR 6.76, 95% CI 1.47–31.06) and being a refugee (OR 4.03, 95% CI 1.83–8.88) increased the odds of developing any impulse control disorder. Being a civilian in a terror region (OR 3.87, 95% CI 1.64–9.12) increased the odds of developing any anxiety disorder. Being robbed or threatened by a weapon increased the odds of developing any anxiety (OR 3.58, 95% CI 1.31–9.76) and any impulse control disorder (OR 12.62, 95% CI 1.51–105.33).

Cumulative War Traumatic Events

The discrete-time survival analysis showed that being very young at the start of the Lebanon wars (aged 0–10 y) increased the risk of developing a first onset of anxiety (OR 2.57, 95% CI 1.08–6.12), mood (OR 3.68, 95% CI 1.61–8.44), and impulse control (0–6 y) (OR 2.08, 95% CI 1.08–4.02) disorders. Females again were at a higher risk for a first onset of anxiety (OR 2.92, 95% CI 1.70–5.04) and mood (OR 1.52, 95% CI 1.14–2.02) disorders compared to males. Being a student (compared to low education) and divorced/separated or widowed (ex-married compared to married), predicted the first onset of mood disorders, but not anxiety or impulse control disorders (OR 1.74, 95% CI 1.15–2.63; OR 3.0, 95% CI 1.39–6.47, respectively) (data available upon request).

Furthermore, there was a cumulative effect of war exposure increasing the likelihood of developing anxiety (OR 5.92), mood (OR 3.32), and impulse control disorders (OR 12.72) for the first time. This cumulative effect was also true for individual disorders (within the broader categories mentioned above), the highest ORs being those for intermittent

explosive disorder (IED) (OR 30.38), post-traumatic stress disorder (PTSD) (OR 10.24), and dysthymia (OR 7.71) (Figure 1). Interaction between war exposure and age at onset of wars was significant only for the category “any anxiety disorder,” showing an increased risk for respondents who were 35 y or older at the onset of the wars compared to each of the remaining age cohorts (63+ y at interview). The interaction of sex and war exposure, as well as marital status, was not significant for anxiety and mood but could not be carried out for impulse control disorders due to small numbers.

Treatment

About half (49.2%) of those with a lifetime mood disorder had obtained treatment for this disorder (Table 4). However, the median delay between age of onset and age of first seeking treatment was 6 y. Only 12.3% obtained treatment in the same year as the onset of their mood disorder. Treatment rates were much lower for other disorders. The proportions ever seeking treatment for the remaining disorders were lower (anxiety, 37.2%; substance, 35.4%; and impulse control disorders, 15.1%). However, delays in seeking treatment for anxiety and substance disorder were longer than that of depression. The median delay for substance disorders was 9 y and that for anxiety disorders was 28 y. The lowest treatment delay among all disorders (3 y) was reported for impulse control.

Discussion

This study presents data on national lifetime prevalence of a wide array of psychiatric disorders in an Arab country, to our knowledge for the first time. One-fourth of the Lebanese adult population met criteria for any of the DSM-IV disorders, and one-third were estimated to do so by age 75 y. Females are at higher risk of developing anxiety and mood

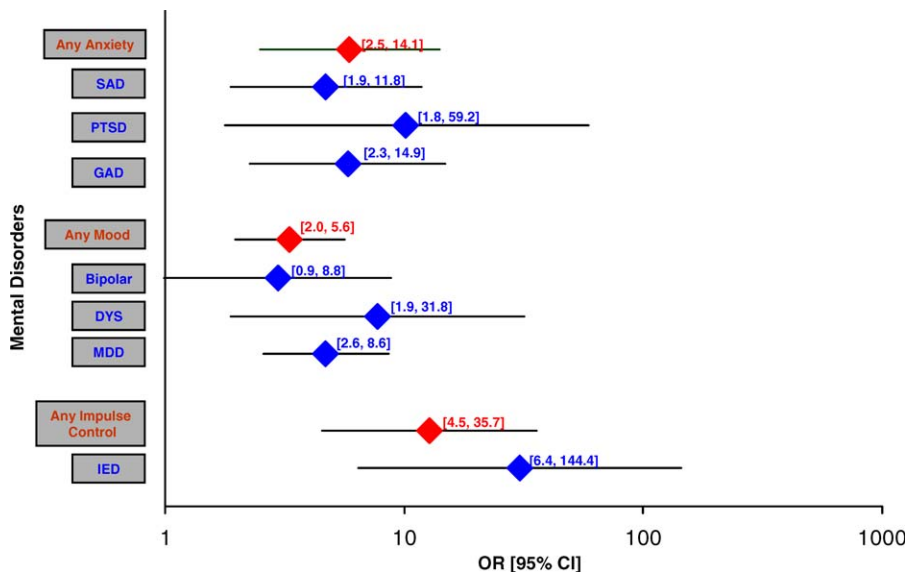


Figure 1. Effect of Cumulative War Trauma on First Onset of Psychiatric Disorders

Disorders with number of cases too small ($n \leq 30$) were not included in this analysis. Odds ratios (diamonds) and 95% confidence intervals are plotted on a logarithmic scale. DYS, dysthymia; GAD, generalized anxiety disorder; IED, intermittent explosive disorder; MDD, major depressive disorder; SAD, separation anxiety disorder; PTSD, post-traumatic stress disorder.

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disorders than are males. Being separated, divorced, or widowed increased the likelihood of developing a mood disorder. The effect of sex and marital status on the first onset of mental disorders was independent of war exposure.

The high prevalence of mental disorders and the early age of onset during the young, formative, and productive years create a considerable national burden. This burden is compounded by long delays in seeking care for these often chronic and recurrent conditions. Seeking treatment in the first year of onset of disorder and shortly after was very low. The extremely long delay for treatment of anxiety disorders was due to onset of many anxiety disorders occurring in childhood and treatment not occurring until adulthood. Whereas barriers to seeking care could include factors such as financial difficulties, stigma, and lack of awareness; shortage of health care professionals in Lebanon is not expected to be one of the reasons. It is estimated that there are 325 physicians per 100,000 population in Lebanon [29], the highest ratio in the Arab World and equivalent to many industrialized countries. Therefore, increasing awareness about mental health conditions and reducing possible taboos rather than

increasing human resources becomes imperative, not only among the general public and health policy makers, but also and most importantly among health care professionals.

In addition, the study examines on a national level the effect of war on developing first-time mental disorders. In our sample, only 31.2% of the Lebanese were not exposed to any war events, whereas 11.1% were exposed to at least four war events. Males were exposed to more war events and to those events that reflect greater mobility in war time, whereas females reported more often being civilians in war regions or refugees. Those who were children at the start of war reported being less exposed to war events, possibly reflecting their lower mobility and lower recall of the war events at that time.

War, analyzed as both individual events and cumulative exposure, increased the risk of developing, for the first time, mental disorders in the life of the Lebanese. This increased risk was shown for all anxiety disorders that had enough participants to be analyzed (separation anxiety disorder [SAD], PTSD, and GAD), for mood disorders (major depressive disorder [MDD] and dysthymia, but not for bipolar disorder), and for impulse control disorder (intermittent

Table 4. Proportional Treatment Contact in the Year of Disorder Onset and Median Duration of Delay among Cases That Subsequently Made Treatment Contact^a

Disorder	Making Treatment Contact in Year of Onset, %	Ever Making Treatment Contact, %	Median Duration of Delay, Years	Number
Any anxiety disorder ^b	3.2	37.3	28	299
Any mood disorder	12.3	49.2	6	349
Any impulse control disorder ^b	3.8	15.1	3	53
Any substance disorder	0.9	35.4	9	38

^aDisorder hierarchy is not used in these diagnoses.

^bAssessed in the Part II sample ($n = 1,031$).

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explosive disorder). This increased risk was highest for impulse control disorders followed by PTSD and dysthymia. It is important to note here that the age cohort effect we report could be explained by either having been exposed to these events during this specific age or being in this age group per se [17,30].

Three main limitations of this study have to be considered. First, adults reporting on past psychiatric disorders, age of onset, treatment, and exposure to war may be subject to differential recall bias. A number of factors, including current psychiatric status, time to first onset of disorders, older age, and severity of episode, might have contributed to this differential recall bias. Second, the survey population excluded institutionalized respondents. Third, given the taboos surrounding mental illness, respondents in a face-to-face interview may have under-reported relevant symptoms. Taking these limitations into consideration, the results are probably an underestimate of the true lifetime prevalence of psychiatric disorders in Lebanon since all these factors are likely to bias the estimates downwards. Moreover, with regard to war exposure, although we looked at specific war events, exposure to the general war environment and its impact on the respondent's mental health was difficult to assess. Also many of the CIs are very wide; consequently, results may not be reliably extrapolated to the whole population.

In conclusion, there is an urgent need to assess not only the prevalence, but also the determinants, of treatment failure and delays in treatment in a comparative manner to obtain robust evidence for policy making with regard to the burden of mental disorders in the Arab World. Furthermore, in the Middle East, where armed conflicts have been commonplace for decades, it is important to recognize that these conflicts result in mental disorders that are not limited to PTSD but also include mood and impulse control disorders that are likely to have long-term implications for the war-exposed populations.

Supporting Information

Alternative Language Abstract S1. Translation of the Abstract into Arabic

Found at doi:10.1371/journal.pmed.0050061.sd001

Alternative Language Abstract S2. Translation of the Abstract into French

Found at doi:10.1371/journal.pmed.0050061.sd002

Text S1. Ethics Approval

Found at doi:10.1371/journal.pmed.0050061.sd003 (171 KB DOC).

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Author contributions. EGK, ZNM, JAF, ANK, SC, and RCK participated in the study concept and design. EGK, ZNM, JAF, and ANK acquired data. EGK, ZNM, HD, JAF, ANK, SC, and RCK analyzed and interpreted data. EGK, ZNM, HD, JAF, ANK, and SC drafted the manuscript. All authors critically revised the manuscript for important intellectual content. EGK, ZNM, HD, and RCK

provided statistical expertise. EGK, ZNM, HD, JAF, ANK, and SCN provided administrative, technical, or material support.

Competing Interests: RCK has been a consultant for Astra Zeneca, Bristol-Myers Squibb, Eli Lilly and Company, GlaxoSmithKline, Pfizer, Sanofi-Aventis, and Wyeth, and has had research support for his epidemiological studies from Bristol-Myers Squibb, Eli Lilly and Company, Ortho-McNeil, Pfizer, and the Pfizer Foundation. The other authors have declared that no competing interests exist.

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References

- Robins LN, Regier DA, editors (1991) *Psychiatric disorders in America: the Epidemiologic Catchment Area Study*. New York: Free Press. 449 p.
- Kessler RC, McGonagle KA, Zhao S, Nelson CB, Hughes M, et al. (1994) Lifetime and 12 month prevalence of DSM III-R psychiatric disorders in the United States. *Arch Gen Psychiatry* 51: 8–19.
- Henderson S, Andrew G, Hall W (2000) Australia's mental health: an overview of the general population survey. *Aust N Z J Psychiatry* 34: 197–205.
- Jenkins R, Lewis G, Bebbington P, Brugha T, Farrell M, et al. (2003) The national Psychiatric Morbidity Surveys of Great Britain: initial findings from the household survey. *Int Rev Psychiatry* 15: 29–42.
- Bijl RV, Ravelli A, van Zessen G (1998) Prevalence of psychiatric disorder in the general population: results of the Netherlands Mental Health survey and Incidence Study (NEMESIS). *Soc Psychiatry Psychiatr Epidemiol* 33: 587–595.
- Murray CJL, Lopez AD, editors (1996) *The global burden of disease: a comprehensive assessment of mortality and disability from diseases, injuries, and risk factors in 1990 and projected to 2020*. Cambridge (Massachusetts): Harvard School of Public Health on behalf of the World Health Organization and World Bank. 990 p.
- World Health Organization (2001) *The world health report 2001: mental health, new understanding, new hope*. Geneva: World Health Organization. Available: <http://www.who.int/whr/2001/en/index.html>. Accessed 15 February 2008.
- Abou Saleh MT, Ghubash R, Daradkeh TK (2001) Al Ain Community Psychiatric Survey I. Prevalence and socio-demographic correlates. *Soc Psychiatry Psychiatr Epidemiol* 36: 20–28.
- Rahim SI, Cederblad M (1989) Epidemiology of mental disorders in young adults of a newly urbanized area in Khartoum, Sudan. *Br J Psychiatry* 155: 44–47.
- Karam EG, Howard D, Karam AN, Ashkar A, Shaaya M, et al. (1998) Major depression and external stressors: the Lebanon Wars. *Eur Arch Psychiatry Clin Neurosci* 248: 225–230.
- Okasha A, Khalil AH, El-Fiky MR, Ghanem M, Abdel-Hakeem R (1998) Prevalence of depressive disorders in a sample of rural and urban Egyptian communities. *Egypt J Psychiatry* 11: 167–181.
- Murthy RS (2007) Mass violence and mental health: recent epidemiological findings. *Int Rev Psychiatry* 19: 183–192.
- De Jong JTV, Komproe IH, Van Ommeren M (2003) Common mental disorders in postconflict settings. *Lancet* 361: 2128–2130.
- Mollica R, McInnis K, Poole C, Tor S (1998) Dose-effect relationships of trauma to symptoms of depression and post-traumatic stress disorders among Cambodian survivors of mass violence. *Br J Psychiatry* 173: 482–488.
- Cardozo BL, Bilukha OO, Crawford CG, Shaikh I, Wolfe MI, et al. (2004) Mental health, social functioning, and disability in postwar Afghanistan. *JAMA* 292: 575–584.
- Green BL, Goodman LA, Krupnick JL, Corcoran CB, Petty RM, et al. (2000) Outcomes of single versus multiple trauma exposure in a screening sample. *J Traumatic Stress* 13: 271–286.
- Demyttenaere K, Bruffaerts R, Posada-Villa J, Gasquet I, Kovess V, et al. (2004) Prevalence, severity, and unmet need for treatment of mental disorders in the World Health Organization World Mental Health Surveys. *JAMA* 291: 2581–2590.
- Karam EG, Mneimneh Z, Karam AN, Fayyad J, Nasser S, et al. (2006) Prevalence and treatment of mental disorders in Lebanon: a national epidemiological survey. *Lancet* 367: 1000–1006.
- Kish L (1965) *Survey sampling*. New York: J. Wiley & Sons. 643 p.
- Administration Centrale de la Statistique (Central Administration for

- Statistics) (1998) Conditions de vie des ménages en 1997. Etudes statistiques no. 9. Beirut (Lebanon): Lebanese Republic.
21. Kessler RC, Ustun TB (2004) The World Mental Health (WMH) survey initiative version of the WHO-CIDI. *Int J Methods Psychiatr Res* 13: 95–121.
 22. First MB, Spitzer RL, Gibbon M, Williams JBW (2002) Structured clinical interview for DSM-IV-TR axis I disorders, research version, non-patient edition (SCID-I/NP). New York: Biometrics Research, New York State Psychiatric Institute.
 23. Kessler RC, Abelson J, Demler O, Escobar JL, Gibbon M, et al. (2004) Clinical calibration of DSM-IV diagnoses in the World Mental Health (WMH) version of the World Health Organization (WHO) Composite International Diagnostic Interview (CIDI). *Int J Methods Psychiatr Res* 13: 122–139.
 24. Haro JM, Arbabzadeh-Bouchez S, Brugha TS, de Girolamo G, Guyer ME, et al. (2006) Concordance of the Composite International Diagnostic Interview Version 3.0 (CIDI 3.0) with standardized clinical assessments in the WHO World Mental Health Surveys. *Int J Methods Psychiatr Res* 15: 167–180.
 25. Halli SS, Rao KV (1992) Advanced techniques of population analysis. New York: Plenum. 226 p.
 26. Efron B (1988) Logistic regression, survival analysis, and the Kaplan-Meier curve. *J Am Stat Assoc* 83: 414–425.
 27. Wolter KM (1985) Introduction to variance estimation. New York: Springer-Verlag. 427 p.
 28. Kish L, Frankel MR (1974) Inferences from complex samples. *J R Stat Soc [Ser A]* 36: 1–37.
 29. World Health Organization (2006) Health Systems Report. Available: http://www.who.int/whosis/whostat2006_healthsystemsresources.pdf. Accessed 26 February 2008
 30. Karam EG (1997) Comorbidity of posttraumatic stress disorder and depression. In: Fullerton CS, Ursano RJ, editors. *Posttraumatic stress disorder*. American Psychiatric Press. pp. 77–90.

Editors' Summary

Background. Mental illnesses—persistent problems with thinking, with feelings, with behavior, and with coping with life—are very common. In the UK about a quarter, and in the US, almost half, of people have a mental illness at some time during their life. Depression, for example, persistently lowers a person's mood and can make them feel hopeless and unmotivated. Anxiety—constant, unrealistic worries about daily life—can cause sleep problems and physical symptoms such as stomach pains. People with impulse-control disorders, have problems with controlling their temper or their impulses which may sometimes lead to hurting themselves or other people. These and other mental illnesses seriously affect the work, relationships, and quality of life of the ill person and of their family. However, most people with mental illnesses can lead fulfilling and productive lives with the help of appropriate medical and nonmedical therapies.

Why Was This Study Done? Recent epidemiological surveys (studies that investigate the factors that affect the health of populations) have provided important information about the burden of mental disorders in some industrialized countries. However, little is known about the global prevalence of mental disorders (the proportion of people in a population with each disorder at one time) or about how events such as wars affect mental health. This information is needed so that individual countries can provide effective mental-health services for their populations. To provide this information, the World Mental Health (WMH) Survey Initiative is undertaking large-scale psychiatric epidemiological surveys in more than 29 countries. As part of this Initiative, researchers have examined the prevalence and treatment of mental disorders in Lebanon and have asked whether war in this country has affected the risk of becoming mentally ill.

What Did the Researchers Do and Find? The researchers randomly selected a sample of nearly 3,000 adults living in Lebanon and interviewed them using an Arabic version of the World Health Organization's "Composite International Diagnostic Interview" (CIDI 3.0). This interview tool generates diagnoses of mental disorders in the form of "DSM-IV codes," the American Psychiatric Association's standard codes for specific mental disorders. The researchers also asked the study participants about their experience of war-related traumatic events such as being a civilian in a war zone or being threatened by a weapon. The researchers found that one in four Lebanese had had one or more DSM-IV disorder at some time during their life. Major depression was the single most common disorder. The researchers also calculated that by the age of 75 years, about one-third of the Lebanese would probably have had one or more DSM-IV disorder. Only half of the Lebanese with a

mood disorder ever received professional help; treatment rates for other mental disorders were even lower. The average delay in treatment ranged from 6 years for mood disorders to 28 years for anxiety disorders. Finally, exposure to war-related events increased the risk of developing an anxiety, mood, or impulse-control disorder by about 6-fold, 3-fold, and 13-fold, respectively.

What Do These Findings Mean? These findings indicate that the prevalence of mental illness in Lebanon is similar to that in the UK and the US, the first time that this information has been available for an Arabic-speaking country. Indeed, the burden of mental illness in Lebanon may actually be higher than these findings suggest, because the taboos associated with mental illness may have stopped some study participants from reporting their problems. The findings also show that in Lebanon exposure to war-related events greatly increases the risk of developing for the first time several mental disorders. Further studies are needed to discover whether this finding is generalizable to other countries. Finally, these findings indicate that many people in Lebanon who develop a mental illness never receive appropriate treatment. There is no shortage of health-care professionals in Lebanon, so the researchers suggest that the best way to improve the diagnosis and treatment of mental disorders in this country might be to increase the awareness of these conditions and to reduce the taboos associated with mental illness, both among the general population and among health-care professionals.

Additional Information. Please access these Web sites via the online version of this summary at <http://dx.doi.org/10.1371/journal.pmed.0050061>.

- Read a related *PLoS Medicine* Perspective article
- IDRAAC has a database that provides access to all published research articles related to mental health in the Arab World
- The UK charity Mind provides information on understanding mental illness
- The US National Institute of Mental Health provides information on understanding, treating, and preventing mental disorders (mainly in English but some information in Spanish)
- MedlinePlus provides a list of useful links to information about mental health
- Wikipedia has a page on DSM-IV codes (note that Wikipedia is a free online encyclopedia that anyone can edit; available in several languages)